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(54)【発明の名称】　非帯電性ティアシート

(57)【要約】
【課題】　安価にかつ容易に製造可能であり、しかもシート全面にわたって帯電防止性能が付与された非帯電性ティアシートを提供する。
【解決手段】　ティアシートは、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂を、ポリオレフィン系樹脂に混合した組成物を含み、表面固有抵抗値が$1.0^{11}\Omega$以下である。

【特許請求の範囲】
【請求項1】 ポリオレフィン系樹脂を含有する非帯電性ティアシートにおいて、
少なくとも、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂が、前記ポリオレフィン系樹脂に混合された組成物を含み、表面固有抵抗値が$10^{11}\Omega$以下であることを特徴とする非帯電性ティアシート。
【請求項2】 前記ポリオレフィン系樹脂および前記ポリオレフィン系骨格がポリプロピレンである、請求項1に記載の非帯電性ティアシート。
【請求項3】 前記親水性ポリマー骨格がポリエチレングリコールである、請求項1または2に記載の非帯電性ティアシート。
【請求項4】 前記共重合樹脂の含有量が3～20質量%である、請求項1ないし3のいずれか1項に記載の非帯電性ティアシート。
【請求項5】 少なくとも表面に抗菌剤が付加された、請求項1ないし4のいずれか1項に記載の非帯電性ティアシート。
【請求項6】 ポリオレフィン系樹脂からなる主層と、該主層の片面または両面に積層された前記組成物からなる表層とからなる、請求項1ないし5のいずれか1項に記載の非帯電性ティアシート。
【請求項7】 厚さが0．3mm～15mmの範囲内である、請求項1ないし6のいずれか1項に記載の非帯電性ティアシート。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】本発明は、パレット上に容器を多段に積み重ねてユニット化する際に使用されるティアシートに関する。
【0002】
【従来の技術】従来、清涼飲料、ビール、食用油、缶詰等に用いられる金属容器、医薬品、工業薬品、液体調味料等に用いられるガラス容器、あるいは液体洗剤、調味料、アイスクリーム等に用いられるプラスチック容器など、多くの分野で多種多様な容器が大量に使用されている。そして、これらの容器の梱包や搬送などの荷役作業のほとんどは機械化あるいは自動化されている。
【0003】上記の梱包や搬送の一態様として、ユニットロード化がある。この方法は、容器などを梱包したり搬送したりする際にこれらを適当な個数または重量に取りまとめて一単位とし、途中で取り崩すことなく一体的に機器によって荷役を行う方法である。
【0004】すなわち、パレット上に一定個数の容器を多数列多段に積み重ねてユニット化した後、シュリンク包装やストレッチ包装などの梱包を行う荷役作業に供するもので、容器をユニット化する際に、容器の安定化、荷崩れの防止、防塵などの目的で各段ごとにティアシートが挿入される。
【0005】従来、ティアシートとしては、紙製のものが多く用いられている。しかし、紙製のシートは吸水、吸湿などにより、曲げ剛性、耐衝撃性などの機械的強度が低下してくることから反復使用に制限がある。しかも、素材が紙であるため毛羽立ちや破損、汚れが著しく、非衛生的であるので、食品や医療品などの塵埃を嫌う分野では使用が制限される。
【0006】これらの問題を解消するものとしてプラスチック製のティアシートもあるが、プラスチック製のティアシートは帯電が著しく塵埃を引き付け易いという問題がある。そこで、プラスチック製のセパレートシートの帯電を防止する方法として、帯電防止剤やカーボンブラックなどを配合する方法や、特公平7－59642号公報に開示されるように導電性繊維を配合する方法などが種々提案されている。
【0007】しかし、帯電防止剤を配合する方法では、長期間にわたる使用やシートの洗浄によって帯電防止剤が浸出し、これにより、周囲や洗浄液が汚染されたり、帯電防止性能が低下したりしてしまう。一方、カーボンブラックを配合したものでは、カーボンの粉が表面に出る恐れがあり、それ自身が塵埃となったり、環境汚染のもとにもなる。さらに、カーボンブラックを配合することによってシートが黒ずんだ色となるため、使用用途が制限される場合もある。さらに、導電性繊維を配合する方法では、帯電防止剤を配合する方法やカーボンブラックを配合する方法における問題は解消されるものの、導電性繊維が高価であり、また、シート全面にわたって良好な帯電防止性能を発揮させるためには成形速度を遅くしなければならなくなる。このことにより、結果的にティアシートの製造コストが高価なものとなってしまう。
【0008】そこで、特公平8－13527号公報には、ティアシートを多層化して表面層のみに導電性繊維を配合することで、導電性繊維の使用量を減少させたティアシートが開示されている。また、特開平11－35064号公報には、ＡＢＳポリマー製のティアシートにおいて、親水性ポリマーと混合することで帯電防止性能を実現させたティアシートが開示されている。
【0009】
【発明が解決しようとする課題】しかしながら、ティアシートを多層化して表面層のみに導電性繊維を配合する方法は、多層シートを作らなければならず装置が複雑化するため、最善の方法とはいえない。また、親水性ポリマーと混合する方法は、ティアシートがＡＢＳポリマー製である場合には、ＡＢＳポリマーは親水性ポリマーとの相溶性があるため帯電防止性能を実現することができるが、ティアシートがポリオレフィン系樹脂の場合には、ポリオレフィン系樹脂は疎水性ポリマーであり親水性ポリマーとの相溶性が極めて悪い。そのため、ポリオレフィン系樹脂と親水性ポリマーとを混合しても、両者

は成形時に互いに分離して島海構造を形成し、親水性ポリマーはポリオレフィン系樹脂中に分散することができないので、ティアシートの全面にわたって帯電防止性能を与えることが困難である。

【００１０】そこで本発明の目的は、安価にかつ容易に製造可能で、しかもシート全面にわたって帯電防止性能が付与された非帯電性ティアシートを提供することである。

【００１１】

【課題を解決するための手段】上記目的を達成するため本発明の非帯電性ティアシートは、ポリオレフィン系樹脂を含有する非帯電性ティアシートにおいて、少なくとも、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂が、前記ポリオレフィン系樹脂に混合された組成物を含み、表面固有抵抗値が$10^{11}\Omega$以下であることを特徴とする。

【００１２】本発明の非帯電性ティアシートでは、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂をポリオレフィン系樹脂に混合することで、この共重合樹脂はポリオレフィン系樹脂に相溶して分散する。これにより、ポリオレフィン系樹脂を用いたティアシートであっても、導電性繊維なしでシート全面にわたって帯電防止性能が得られる。しかも、ポリオレフィン系樹脂に共重合樹脂を混合するだけで、通常のポリオレフィン系樹脂シートを成形するのと同様に製造することができるので、製造も容易である。

【００１３】

【発明の実施の形態】本発明のティアシートは、ポリオレフィン系樹脂を第１成分、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂を第２成分とし、これらを混合して押出成形法などによりシート状に成形されたものである。

【００１４】このように、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂を第1成分であるポリオレフィン系樹脂のマトリクスに加えることで、共重合樹脂のポリオレフィン系骨格の部分はポリオレフィン系樹脂と相溶性があるため、疎水性ポリマーであるポリオレフィン系樹脂を用いたティアシートであっても、共重合樹脂はポリオレフィン系樹脂のマトリクスに部分的に取り込まれて分散する。その結果、高価な導電性繊維を用いなくても、ティアシートの全面にわたって帯電防止性能を付与することができる。また、共重合樹脂をポリオレフィン系樹脂に含有させて帯電防止性能を発揮させることにより、従来の帯電防止剤を配合したティアシートのように洗浄によって帯電防止性能が低下することはなく、永久的に帯電防止性能を維持することができる。しかも、カーボンブラックを用いる必要もないので、カーボンブラック自身による塵埃の発生を防止しかつ色合いの黒ずみも防止することができる。さらに、導電性繊維を用いないことにより、通常のポリオレフィン系樹脂シートを製造するのと同様のプロセスで容易かつ効率的にティアシートを製造することができる。

【００１５】ティアシートにおける共重合樹脂の含有量は、３～２０質量％が好ましい。３質量％未満では、十分な帯電防止性能を得ることができなくなるおそれがある。一方、２０質量％を超えると、ポリオレフィン系樹脂のマトリクスの物性を大きく変えてしまうおそれがあり、また、共重合樹脂はポリオレフィン系樹脂よりも高価であるため製造コスト的に不利になる。

【００１６】第１成分であるポリオレフィン系樹脂としては、ポリプロピレン樹脂、ポリエチレン樹脂、エチレンプロピレン共重合樹脂などを好適に用いることができる。共重合樹脂を構成するポリオレフィン系骨格としては、共重合樹脂をポリオレフィン系樹脂中により均一に分散させるためには、ポリオレフィン系樹脂と同じ材料を用いるのが好ましい。たとえば、ポリオレフィン系樹脂がポリプロピレンである場合、ポリオレフィン系骨格にもポリプロピレンが好適に用いられる。また、共重合樹脂を構成する親水性ポリマー骨格としては、アミド基、アルコール基、カルボキシル基などを持ったポリマーを利用することができ、具体的には、ポリアミド骨格、ポリビニルアルコール骨格、ポリエチレングリコール骨格などが挙げられる。

【００１７】ティアシートの表面固有抵抗値は、$10^{11}\Omega$以下である。表面固有抵抗値が$10^{11}\Omega$を超えると、帯電防止性能が低く、塵埃を呼び寄せ易くなる。ティアシートの厚さは０．３～１５ｍｍの範囲であることが適当である。厚さが０．３ｍｍ未満では、ティアシートの剛性などの機械的強度が十分でなく、また、１５ｍｍを超えると、ティアシートの重量が大きくなり、荷役作業の自動化や取り扱いに支障を来たすおそれを生じる。

【００１８】ティアシートが、飲食品用容器あるいは薬品用容器など衛生性を要求される容器の搬送や梱包に用いられる場合、ティアシートに黴や雑菌が発生するのを抑えるために、抗菌剤を含有させることが好ましい。抗菌剤としては、特に制限されないが、銀、銅、亜鉛などの抗菌性金属、特に銀イオンを含有した溶解性ガラスを好適に用いることができる。また、抗菌剤をティアシートに含有させる方法としては、成形後のティアシートの表面に抗菌剤を塗布する方法、および成形前のティアシート材料に第３の成分として抗菌剤を添加する方法のいずれも適用可能である。成形前のティアシート材料に抗菌剤を添加する方法は、成形後の塗布工程が不要であるので、製造工程が簡略化され、製造コストの低減を図ることができる。

【００１９】上述した例では、単層のティアシートを例に挙げて説明したが、多層構造としてもよい。この場合、ポリオレフィン系樹脂からなるシートを主層とし、その片面または両面に、上記の少なくとも第１成分および第２成分を含むシートを表層として積層した構造とす

ることで、共重合樹脂の使用量を減らすことができる。

【００２０】

【実施例】以下に、本発明の具体的な実施例について、比較例とともに説明する。

【００２１】（実施例１）第1成分であるポリオレフィン系樹脂として、サンアロマー社製ポリプロピレン、Ｅ３００Ａ（商品名）、第２成分である共重合樹脂として、三洋化成工業社製帯電防止剤、ペレスタット３０００（商品名）を用い、これらを混合して単層Ｔダイ装置で成形し、厚さが１ｍｍのティアシートを作製した。本例で用いた共重合樹脂は、ポリオレフィン系骨格としてポリプロピレンを有し、親水性ポリマー骨格としてポリエチレングリコールを有する。共重合樹脂の含有量は１０質量％とした。単層Ｔダイ装置の成形能力は、最大で１０ｍ／分であり、本例ではその最大速度で成形した。

【００２２】（実施例２）共重合樹脂の含有量を５質量％としたこと以外は実施例１と同様にしてティアシートを作製した。

【００２３】（実施例３）多層Ｔダイ装置を用い、主層と表層との２層構造のティアシートを作製した。主層を構成する材料には、サンアロマー社製ポリプロピレン、Ｅ３００Ａ（商品名）を用いた。表層は、実施例２で用いたものと同じ組成とした。各層の厚さは、主層が０．８５ｍｍ、表層が０．１５ｍｍとし、ティアシート全体での厚さを１ｍｍとした。多層Ｔダイ装置の成形能力は、最大で１０ｍ／分であり、本例ではその最大速度で成形した。

【００２４】（比較例１）実施例１で用いたポリプロピレンを用いて実施例１と同じ単層Ｔダイ装置で成形し、厚さが１ｍｍのティアシートを作製した。ティアシートの成形速度は１０ｍ／分とした。

【００２５】（比較例２）実施例１で用いたポリプロピレンに、炭素繊維として東邦テナックス社製炭素繊維、ベスファイトＨＴＡ（商品名）を混合し、実施例１と同じ単層Ｔダイ装置によって厚さ１ｍｍのティアシートを作製した。炭素繊維の含有量は、１０質量％とした。なお、成形速度については、成形速度を上げるとティアシートの表面固有抵抗値が高くなってしまうため、炭素繊維の効果が発揮される限界まで下げて行った。成形速度を下げていくと、表面固有抵抗値が突然小さくなる臨界値があり、本例では、そのときの成形速度は４ｍ／分であった。

【００２６】（比較例３）多層Ｔダイ装置を用い、主層と表層との２層構造のティアシートを作製した。主層には比較例１と同じポリプロピレンを用い、表層には比較例２と同じ組成のものを用いた。各層の厚さは、主層が０．８５ｍｍ、表層が０．１５ｍｍとし、ティアシート全体での厚さを１ｍｍとした。成形速度については、比較例２と同様に、炭素繊維の効果が発揮される限界まで下げて行った。本例では３ｍ／分であった。

【００２７】上述した実施例１～３および比較例１～３の組成および評価結果を表１に示す。なお、表１において、材料コストについては、ポリプロピレンのみを用いたものを基準とし、その１．５倍以下である場合を「◎」、１．５倍を超え、２倍以下である場合を「○」、２倍を超える場合を「△」、その中でも２倍を大幅に超える場合を「×」で表している。また、生産性については、ティアシートを成形装置の最大速度で成形した場合を「○」、最大速度の半分以下の速度で成形した場合を「×」で表している。

【００２８】

【表１】

	組　　成	表面固有抵抗値（Ω）	材料コスト	生産性
実施例1	ポリプロピレン 共重合樹脂　10質量% （PP／ポリエチレングリコール）	10^{10}	○	○
実施例2	ポリプロピレン 共重合樹脂　5質量% （PP／ポリエチレングリコール）	10^{11}	○	○
実施例3	表層 ポリプロピレン 共重合樹脂　5質量% （PP／ポリエチレングリコール 主層 ポリプロピレン	10^{11}	◎	○
比較例1	ポリプロピレン	10^{16}	◎	○
比較例2	ポリプロピレン 炭素繊維　10質量%	10^{6}	×	×
比較例3	表層 ポリプロピレン 炭素繊維　10質量% 主層 ポリプロピレン	10^{8}	△	×

【0029】実施例1～3では、Tダイ装置の最大能力で成形を行っても問題なく成形することができ、また、表面固有抵抗値も10^{11}Ω以下となり、十分な帯電防止性能を持つティアシートを得ることができた。一方、比較例1では、材料コストも安価でかつ生産性も良好であったが、表面固有抵抗値が10^{15}Ωと高くなり、十分な帯電防止性能を持たせることができなかった。また、比較例2および3では、炭素繊維を含有させたことにより帯電防止性能は十分なものとなったが、そのためには成形速度を下げざるを得ず、結果的に生産性が半分以下に低下してしまった。以上から、ポリオレフィン系骨格および親水性ポリマー骨格を持つ共重合樹脂を含有させることで、炭素繊維を用いることなく、全面にわたって安定した帯電防止性能を有するティアシートを高い生産性で製造することができる。

【0030】

【発明の効果】以上説明したように本発明によれば、ポリオレフィン系樹脂を含有するティアシートにおいて、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂を混合することで、この共重合樹脂はポリオレフィン系樹脂に相溶して分散するので、導電性繊維を用いなくてもシート全面にわたって安定した帯電防止性能を得ることができる。しかも、通常のポリオレフィン系樹脂シートを成形するのと同様に安価にかつ容易に製造することができる。

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(54) ANTISTATIC TEAR SHEET

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an antistatic tear sheet which can be inexpensively and easily manufactured wherein antistatic performance is obtained on an entire sheet.
SOLUTION: The tear sheet comprises a composition including a copolymer resin having both a polyolefin-based skeleton and a hydrophillic polymer skeleton mixed into a polyolefin-based resin. Its surface resistivity value is 1011 Ωor less.

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CLAIMS

[Claim(s)]
[Claim 1] The un-charging nature TIA sheet characterized by a surface specific resistance value being 1011ohms or less including the constituent with which copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame was mixed by said polyolefine system resin at least in the un-charging nature TIA sheet containing polyolefine system resin.
[Claim 2] The un-charging nature TIA sheet according to claim 1 said polyolefine system resin and said whose polyolefine system frame are polypropylene.
[Claim 3] The un-charging nature TIA sheet according to claim 1 or 2 said whose hydrophilic polymer frame is a polyethylene glycol.
[Claim 4] An un-charging nature TIA sheet given in claim 1 thru/or any 1 term of 3 whose content of said copolymerization resin is three to 20 mass %.
[Claim 5] An un-charging nature TIA sheet given in claim 1 thru/or any 1 term of 4 by which the antimicrobial agent was added at least to the front face.
[Claim 6] An un-charging nature TIA sheet given in claim 1 thru/or any 1 term of 5 which consists of a main stratum which consists of polyolefine system resin, and a surface which consists of said constituent by which the laminating was carried out to one side or both sides of this main stratum.
[Claim 7] An un-charging nature TIA sheet given in claim 1 thru/or any 1 term of 6 which is within the limits whose thickness is 0.3mm - 15mm.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the TIA sheet used in case unitization of the container is accumulated and carried out on a pallet multistage.
[0002]
[Description of the Prior Art] Conventionally, a variety of containers are used for the large quantity in many fields, such as a plastic envelope used for the glassware used for the metal vessel and drugs which are used for a soft drink, Biel, edible oil, canning, etc., heavy chemicals, a liquid seasoning, etc. or liquid detergent, a seasoning, ice cream, etc. And most of cargo work activities, such as packing of these containers and conveyance, are mechanized or automated.
[0003] There is unit load-ization as one mode of the above-mentioned packing or conveyance. This approach is an approach a device performs cargo work in one, without adjusting these in the suitable number or weight, considering as one unit, and pulling down on the way, in case a container etc. is packed up or conveyed.
[0004] Namely, in case the cargo work activity which packs up shrink packaging, stretch packaging, etc. is presented and unitization of the container is carried out after accumulating and carrying out unitization of many containers of the fixed number on a pallet train multistage, a TIA sheet is inserted for every stage for the object, such as stabilization of a container, prevention of collapse of cargo piles, and protection against dust.
[0005] Conventionally, many things made of paper are used as a TIA sheet. However, according to water absorption, moisture absorption, etc., since mechanical strengths, such as flexural rigidity and shock resistance, fall, the sheet made of paper has a limit in periodic duty. And since a raw material is paper and they are [fuzz, and breakage and dirt are remarkable and] insanitary, an activity is restricted in the field which dislikes dust, such as food and medical supplies.
[0006] Although the TIA sheet made from plastics is also one of those solve these problems, the TIA sheet made from plastics has the problem that electrification tends to draw dust remarkably. Then, the approach of blending an antistatic agent, carbon black, etc., the approach of blending conductive fiber so that it may be indicated by JP,7-59642,B, etc. are variously proposed as an approach of preventing electrification of the separate seat made from plastics.
[0007] However, by the approach of blending an antistatic agent, by the activity over a long period of time, or washing of a sheet, an antistatic agent exudes, thereby, a perimeter and a penetrant remover will be polluted or the antistatic engine performance will fall. On the other hand, in what blended carbon black, there is a possibility that the powder of carbon may come out to a front face, and itself becomes dust or also becomes the basis of environmental pollution. Furthermore, since a sheet serves as a dark color by blending carbon black, an activity application may be restricted. Furthermore, by the approach of blending conductive fiber, although the problem in the approach of blending an antistatic agent or the approach of blending carbon black is solved, conductive fiber is expensive, and in order to demonstrate the good antistatic engine performance over the whole sheet surface, a shaping rate must be made late. By this, the manufacturing cost of a TIA sheet will become expensive as a result.

[0008] So, the TIA sheet which decreased the amount of the conductive fiber used is indicated by JP,8-13527,B by multilayering a TIA sheet and blending conductive fiber only with a surface layer. Moreover, the TIA sheet which made JP,11-35064,A realize the antistatic engine performance by mixing with a hydrophilic polymer in the TIA sheet made from an ABS polymer is indicated.
[0009]
[Problem(s) to be Solved by the Invention] However, since a multilayer sheet must be made and equipment is complicated, the approach of multilayering a TIA sheet and blending conductive fiber only with a surface layer cannot be said as the best approach. Moreover, when a TIA sheet is polyolefine system resin, polyolefine system resin is a hydrophobic polymer and its compatibility with a hydrophilic polymer is very bad [when the TIA sheet of the approach of mixing with a hydrophilic polymer is a product made from an ABS polymer, since there is compatibility with a hydrophilic polymer, an ABS polymer can realize the antistatic engine performance, but]. Therefore, since both cannot dissociate mutually at the time of shaping, and cannot form **** structure and a hydrophilic polymer cannot be distributed in polyolefine system resin even if it mixes polyolefine system resin and a hydrophilic polymer, it is difficult to give the antistatic engine performance over the whole surface of a TIA sheet.
[0010] Then, the object of this invention is offering the un-charging nature TIA sheet with which it could manufacture cheaply and easily and the antistatic engine performance's was moreover given over the whole sheet surface.
[0011]
[Means for Solving the Problem] In order to attain the above-mentioned object, the un-charging nature TIA sheet of this invention is characterized by a surface specific resistance value being 1011ohms or less at least in the un-charging nature TIA sheet containing polyolefine system resin including the constituent with which copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame was mixed by said polyolefine system resin.
[0012] By mixing copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame to polyolefine system resin, this copolymerization resin is compatible in polyolefine system resin, and the un-charging nature TIA sheet of this invention distributes it. Thereby, even if it is a TIA sheet using polyolefine system resin, the antistatic engine performance is obtained without conductive fiber over the whole sheet surface. And since it can manufacture the same with only mixing copolymerization resin to polyolefine system resin, and fabricating the usual polyolefine system resin sheet, manufacture is also easy.
[0013]
[Embodiment of the Invention] The TIA sheet of this invention uses as the 2nd component the copolymerization resin which has the both sides of the 1st component, a polyolefine system frame, and a hydrophilic polymer frame for polyolefine system resin, mixes these, and is fabricated by the extrusion method etc. in the shape of a sheet.
[0014] Thus, by adding copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame to the matrix of the polyolefine system resin which is the 1st component, since the part of the polyolefine system frame of copolymerization resin has polyolefine system resin and compatibility, even if it is a TIA sheet using the polyolefine system resin which is a hydrophobic polymer, copolymerization resin is selectively incorporated by the matrix of polyolefine system resin, and it distributes it to it. Consequently, even if it does not use expensive conductive fiber, the antistatic engine performance can be given over the whole surface of a TIA sheet. Moreover, by making polyolefine system resin contain copolymerization resin, and demonstrating the antistatic engine performance, the antistatic engine performance cannot fall by washing like the TIA sheet which blended the conventional antistatic agent, and the antistatic engine performance can be maintained eternally. and generating of the dust by carbon black itself since it is not necessary to use carbon black — preventing — and a hue — also becoming blackish — it can prevent. Furthermore, a TIA sheet can be manufactured easily and efficiently in the process same with manufacturing the usual polyolefine system resin sheet

[0015] The content of the copolymerization resin in a TIA sheet has desirable 3 - 20 mass %. There is a possibility that it may become impossible to obtain sufficient antistatic engine performance, under by 3 mass %. On the other hand, if 20 mass % is exceeded, there is a possibility of changing the physical properties of the matrix of polyolefine system resin a lot, and since copolymerization resin is more expensive than polyolefine system resin, it will become disadvantageous in manufacturing cost.
[0016] As polyolefine system resin which is the 1st component, polypropylene resin, polyethylene resin, ethylene propylene copolymerization resin, etc. can be used suitably. As a polyolefine system frame which constitutes copolymerization resin, in order to make homogeneity distribute copolymerization resin by the inside of polyolefine system resin, it is desirable to use the same ingredient as polyolefine system resin. For example, when polyolefine system resin is polypropylene, polypropylene is suitably used also for a polyolefine system frame. Moreover, as a hydrophilic polymer frame which constitutes copolymerization resin, a polymer with an amide group, an alcoholic radical, a carboxyl group, etc. can be used, and, specifically, a polyamide frame, a polyvinyl alcohol frame, a polyethylene-glycol frame, etc. are mentioned.
[0017] The surface specific resistance value of a TIA sheet is 1011ohms or less. If a surface specific resistance value exceeds 1011 ohms, the antistatic engine performance will be low and it will become easy to call dust. It is suitable for the thickness of a TIA sheet that it is the range of 0.3-15mm. If less than 0.3mm of thickness is not enough as mechanical strengths of a TIA sheet, such as rigidity, and it exceeds 15mm, the weight of a TIA sheet will become large and a possibility of causing trouble to automation of a cargo work activity and handling will be produced.
[0018] When a TIA sheet is used for conveyance and packing of a container of which health nature, such as a container for eating-and-drinking articles or a container for chemicals, is required, in order to suppress that mold and saprophytic bacteria are generated on a TIA sheet, it is desirable to make an antimicrobial agent contain. Especially as an antimicrobial agent, although not restricted, the soluble glass containing antibacterial metals, such as silver, copper, and zinc, especially complex ion can be used suitably. Moreover, as an approach of making a TIA sheet containing an antimicrobial agent, both the approach of applying an antimicrobial agent to the front face of the TIA sheet after shaping and the approach of adding an antimicrobial agent as the 3rd component to the Tia sheet material before shaping are applicable. Since the spreading process after shaping is unnecessary, a production process is simplified and the approach of adding an antimicrobial agent to the Tia sheet material before shaping can aim at reduction of a manufacturing cost.
[0019] Although the TIA sheet of a monolayer was mentioned as the example and the example mentioned above explained it, it is good also as multilayer structure. In this case, the amount of the copolymerization resin used can be reduced by considering as the structure which used as the main stratum the sheet which consists of polyolefine system resin, made the surface the above-mentioned sheet which contains the 1st component and the 2nd component at least, and carried out the laminating to those one side or both sides.
[0020]
[Example] Below, the concrete example of this invention is explained with the example of a comparison.
[0021] (Example 1) As polyolefine system resin which is the 1st component, using the antistatic agent by Sanyo Chemical Industries, Ltd., and PERESUTATTO 3000 (trade name) as copolymerization resin which is Sun Alomar polypropylene, E300A (trade name), and the 2nd component, these were mixed, it fabricated with monolayer T-die equipment, and the TIA sheet whose thickness is 1mm was produced. The copolymerization resin used by this example has polypropylene as a polyolefine system frame, and has a polyethylene glycol as a hydrophilic polymer frame. The content of copolymerization resin was made into 10 mass %. The forming performance force of monolayer T-die equipment is a part for 10m/at the maximum, and was fabricated by this example with the maximum velocity.
[0022] (Example 2) The TIA sheet was produced like the example 1 except having made the

[0023] (Example 3) The TIA sheet of the two-layer structure of a main stratum and a surface was produced using multilayer T-die equipment. Sun Alomar polypropylene and E300A (trade name) were used for the ingredient which constitutes a main stratum. The surface was taken as the same presentation as what was used in the example 2. The main stratum set to 0.85mm, and the surface set thickness of each class to 0.15mm, and it set thickness in the whole TIA sheet to 1mm. The forming performance force of multilayer T-die equipment is a part for 10m/at the maximum, and was fabricated by this example with the maximum velocity.
[0024] (Example 1 of a comparison) It fabricated with the same monolayer T-die equipment as an example 1 using the polypropylene used in the example 1, and the TIA sheet whose thickness is 1mm was produced. The shaping rate of a TIA sheet was considered as a part for 10m/.
[0025] (Example 2 of a comparison) In the polypropylene used in the example 1, the carbon fiber by Toho Tenax Co., Ltd. and BESUFAITO HTA (trade name) were mixed as a carbon fiber, and the TIA sheet with a thickness of 1mm was produced with the same monolayer T-die equipment as an example 1 in it. The content of a carbon fiber was made into 10 mass %. In addition, about the shaping rate, since the surface specific resistance value of a TIA sheet would become high if a shaping rate is gathered, it lowered and went to the limitation that the effectiveness of a carbon fiber is demonstrated. When the shaping rate was lowered, there was a critical value to which a surface specific resistance value becomes small suddenly, and the shaping rate at that time was a part for 4m/in this example.
[0026] (Example 3 of a comparison) The TIA sheet of the two-layer structure of a main stratum and a surface was produced using multilayer T-die equipment. The thing of the same presentation as the example 2 of a comparison was used for the main stratum at the surface using the same polypropylene as the example 1 of a comparison. The main stratum set to 0.85mm, and the surface set thickness of each class to 0.15mm, and it set thickness in the whole TIA sheet to 1mm. About the shaping rate, it lowered and went to the limitation that the effectiveness of a carbon fiber is demonstrated, like the example 2 of a comparison. In this example, it was a part for 3m/.
[0027] A presentation and assessment result of the examples 1-3 mentioned above and the examples 1-3 of a comparison are shown in a table 1. In addition, in a table 1, the case where the case where exceed "O" and 1.5 times for the case where they are the 1.5 or less times, on the basis of what used only polypropylene, and "O" and twice are exceeded for the case where it is 2 double less or equal is exceeded substantially twice also "**" and in it is expressed with "x" about ingredient cost. Moreover, about productivity, the case where the case where a TIA sheet is fabricated with the maximum velocity of shaping equipment is fabricated at the rate below "O" and one half of maximum velocity is expressed with "x."
[0028]
[A table 1]

	組　　成	表面固有抵抗値（Ω）	材料コスト	生産性
実施例1	ポリプロピレン 共重合樹脂　１０質量% （ＰＰ／ポリエチレングリコール）	10^{10}	○	○
実施例2	ポリプロピレン 共重合樹脂　　５質量% （ＰＰ／ポリエチレングリコール）	10^{11}	○	○
実施例3	表層 ポリプロピレン 共重合樹脂　　５質量% （ＰＰ／ポリエチレングリコール 主層 ポリプロピレン	10^{11}	◎	○
比較例1	ポリプロピレン	10^{15}	◎	○
比較例2	ポリプロピレン 炭素繊維　　１０質量%	10^{6}	×	×
比較例3	表層 ポリプロピレン 炭素繊維　　１０質量% 主層 ポリプロピレン	10^{6}	△	×

[0029] In the examples 1-3, even if fabricated by the maximum capacity of T-die equipment, it could fabricate satisfactory, and the surface specific resistance value was also able to be set to 1011ohms or less, and the TIA sheet with sufficient antistatic engine performance was able to be obtained. On the other hand, in the example 1 of a comparison, although ingredient cost was also cheap and productivity was also good, a surface specific resistance value was not able to become high with 1015 ohms, and sufficient antistatic engine performance was not able to be given. Moreover, although the antistatic engine performance became sufficient thing by having made the carbon fiber contain in the examples 2 and 3 of a comparison, for that purpose, a lowering colander was not obtained but productivity has fallen the shaping rate below to one half as a result. As mentioned above, the TIA sheet which has the antistatic engine performance stabilized over the whole surface by making copolymerization resin with a polyolefine system frame and a hydrophilic polymer frame contain, without using a carbon fiber can be manufactured for high productivity.

[0030]

[Effect of the Invention] Since according to this invention this copolymerization resin is compatible in polyolefine system resin and is distributed by mixing copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame in the TIA sheet containing polyolefine system resin as explained above, even if it does not use conductive fiber, the antistatic engine performance stabilized over the whole sheet surface can be obtained. And it can manufacture cheaply and easily the same with fabricating the usual polyolefine system resin sheet.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the TIA sheet used in case unitization of the container is accumulated and carried out on a pallet multistage.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Conventionally, a variety of containers are used for the large quantity in many fields, such as a plastic envelope used for the glassware used for the metal vessel and drugs which are used for a soft drink, Biel, edible oil, canning, etc., heavy chemicals, a liquid seasoning, etc. or liquid detergent, a seasoning, ice cream, etc. And most of cargo work activities, such as packing of these containers and conveyance, are mechanized or automated.
[0003] There is unit load-ization as one mode of the above-mentioned packing or conveyance. This approach is an approach a device performs cargo work in one, without adjusting these in the suitable number or weight, considering as one unit, and pulling down on the way, in case a container etc. is packed up or conveyed.
[0004] Namely, in case the cargo work activity which packs up shrink packaging, stretch packaging, etc. is presented and unitization of the container is carried out after accumulating and carrying out unitization of many containers of the fixed number on a pallet train multistage, a TIA sheet is inserted for every stage for the object, such as stabilization of a container, prevention of collapse of cargo piles, and protection against dust.
[0005] Conventionally, many things made of paper are used as a TIA sheet. However, according to water absorption, moisture absorption, etc., since mechanical strengths, such as flexural rigidity and shock resistance, fall, the sheet made of paper has a limit in periodic duty. And since a raw material is paper and they are [fuzz, and breakage and dirt are remarkable and] insanitary, an activity is restricted in the field which dislikes dust, such as food and medical supplies.
[0006] Although the TIA sheet made from plastics is also one of those solve these problems, the TIA sheet made from plastics has the problem that electrification tends to draw dust remarkably. Then, the approach of blending an antistatic agent, carbon black, etc., the approach of blending conductive fiber so that it may be indicated by JP,7-59642,B, etc. are variously proposed as an approach of preventing electrification of the separate seat made from plastics.
[0007] However, by the approach of blending an antistatic agent, by the activity over a long period of time, or washing of a sheet, an antistatic agent exudes, thereby, a perimeter and a penetrant remover will be polluted or the antistatic engine performance will fall. On the other hand, in what blended carbon black, there is a possibility that the powder of carbon may come out to a front face, and itself becomes dust or also becomes the basis of environmental pollution. Furthermore, since a sheet serves as a dark color by blending carbon black, an activity application may be restricted. Furthermore, by the approach of blending conductive fiber, although the problem in the approach of blending an antistatic agent or the approach of blending carbon black is solved, conductive fiber is expensive, and in order to demonstrate the good antistatic engine performance over the whole sheet surface, a shaping rate must be made late. By this, the manufacturing cost of a TIA sheet will become expensive as a result.
[0008] So, the TIA sheet which decreased the amount of the conductive fiber used is indicated by JP,8-13527,B by multilayering a TIA sheet and blending conductive fiber only with a surface layer. Moreover, the TIA sheet which made JP,11-35064,A realize the antistatic engine performance by mixing with a hydrophilic polymer in the TIA sheet made from an ABS polymer is indicated.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Since according to this invention this copolymerization resin is compatible in polyolefine system resin and is distributed by mixing copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame in the TIA sheet containing polyolefine system resin as explained above, even if it does not use conductive fiber, the antistatic engine performance stabilized over the whole sheet surface can be obtained. And it can manufacture cheaply and easily the same with fabricating the usual polyolefine system resin sheet.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since a multilayer sheet must be made and equipment is complicated, the approach of multilayering a TIA sheet and blending conductive fiber only with a surface layer cannot be said as the best approach. Moreover, when a TIA sheet is polyolefine system resin, polyolefine system resin is a hydrophobic polymer and its compatibility with a hydrophilic polymer is very bad [when the TIA sheet of the approach of mixing with a hydrophilic polymer is a product made from an ABS polymer, since there is compatibility with a hydrophilic polymer, an ABS polymer can realize the antistatic engine performance, but]. Therefore, since both cannot dissociate mutually at the time of shaping, and cannot form **** structure and a hydrophilic polymer cannot be distributed in polyolefine system resin even if it mixes polyolefine system resin and a hydrophilic polymer, it is difficult to give the antistatic engine performance over the whole surface of a TIA sheet.
[0010] Then, the object of this invention is offering the un-charging nature TIA sheet with which it could manufacture cheaply and easily and the antistatic engine performance's was moreover given over the whole sheet surface.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned object, the un-charging nature TIA sheet of this invention is characterized by a surface specific resistance value being 1011ohms or less at least in the un-charging nature TIA sheet containing polyolefine system resin including the constituent with which copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame was mixed by said polyolefine system resin.

[0012] By mixing copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame to polyolefine system resin, this copolymerization resin is compatible in polyolefine system resin, and the un-charging nature TIA sheet of this invention distributes it. Thereby, even if it is a TIA sheet using polyolefine system resin, the antistatic engine performance is obtained without conductive fiber over the whole sheet surface. And since it can manufacture the same with only mixing copolymerization resin to polyolefine system resin, and fabricating the usual polyolefine system resin sheet, manufacture is also easy.

[0013]

[Embodiment of the Invention] The TIA sheet of this invention uses as the 2nd component the copolymerization resin which has the both sides of the 1st component, a polyolefine system frame, and a hydrophilic polymer frame for polyolefine system resin, mixes these, and is fabricated by the extrusion method etc. in the shape of a sheet.

[0014] Thus, by adding copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame to the matrix of the polyolefine system resin which is the 1st component, since the part of the polyolefine system frame of copolymerization resin has polyolefine system resin and compatibility, even if it is a TIA sheet using the polyolefine system resin which is a hydrophobic polymer, copolymerization resin is selectively incorporated by the matrix of polyolefine system resin, and it distributes it to it. Consequently, even if it does not use expensive conductive fiber, the antistatic engine performance can be given over the whole surface of a TIA sheet. Moreover, by making polyolefine system resin contain copolymerization resin, and demonstrating the antistatic engine performance, the antistatic engine performance cannot fall by washing like the TIA sheet which blended the conventional antistatic agent, and the antistatic engine performance can be maintained eternally. and generating of the dust by carbon black itself since it is not necessary to use carbon black — preventing — and a hue — also becoming blackish — it can prevent. Furthermore, a TIA sheet can be manufactured easily and efficiently in the process same with manufacturing the usual polyolefine system resin sheet by not using conductive fiber.

[0015] The content of the copolymerization resin in a TIA sheet has desirable 3 - 20 mass %. There is a possibility that it may become impossible to obtain sufficient antistatic engine performance, under by 3 mass %. On the other hand, if 20 mass % is exceeded, there is a possibility of changing the physical properties of the matrix of polyolefine system resin a lot, and since copolymerization resin is more expensive than polyolefine system resin, it will become disadvantageous in manufacturing cost.

[0016] As polyolefine system resin which is the 1st component, polypropylene resin, polyethylene resin, ethylene propylene copolymerization resin, etc. can be used suitably. As a polyolefine

system frame which constitutes copolymerization resin, in order to make homogeneity distribute copolymerization resin by the inside of polyolefine system resin, it is desirable to use the same ingredient as polyolefine system resin. For example, when polyolefine system resin is polypropylene, polypropylene is suitably used also for a polyolefine system frame. Moreover, as a hydrophilic polymer frame which constitutes copolymerization resin, a polymer with an amide group, an alcoholic radical, a carboxyl group, etc. can be used, and, specifically, a polyamide frame, a polyvinyl alcohol frame, a polyethylene-glycol frame, etc. are mentioned.

[0017] The surface specific resistance value of a TIA sheet is 1011ohms or less. If a surface specific resistance value exceeds 1011 ohms, the antistatic engine performance will be low and it will become easy to call dust. It is suitable for the thickness of a TIA sheet that it is the range of 0.3-15mm. If less than 0.3mm of thickness is not enough as mechanical strengths of a TIA sheet, such as rigidity, and it exceeds 15mm, the weight of a TIA sheet will become large and a possibility of causing trouble to automation of a cargo work activity and handling will be produced.

[0018] When a TIA sheet is used for conveyance and packing of a container of which health nature, such as a container for eating-and-drinking articles or a container for chemicals, is required, in order to suppress that mold and saprophytic bacteria are generated on a TIA sheet, it is desirable to make an antimicrobial agent contain. Especially as an antimicrobial agent, although not restricted, the soluble glass containing antibacterial metals, such as silver, copper, and zinc, especially complex ion can be used suitably. Moreover, as an approach of making a TIA sheet containing an antimicrobial agent, both the approach of applying an antimicrobial agent to the front face of the TIA sheet after shaping and the approach of adding an antimicrobial agent as the 3rd component to the Tia sheet material before shaping are applicable. Since the spreading process after shaping is unnecessary, a production process is simplified and the approach of adding an antimicrobial agent to the Tia sheet material before shaping can aim at reduction of a manufacturing cost.

[0019] Although the TIA sheet of a monolayer was mentioned as the example and the example mentioned above explained it, it is good also as multilayer structure. In this case, the amount of the copolymerization resin used can be reduced by considering as the structure which used as the main stratum the sheet which consists of polyolefine system resin, made the surface the above-mentioned sheet which contains the 1st component and the 2nd component at least, and carried out the laminating to those one side or both sides.

[Translation done.]

EXAMPLE

[Example] Below, the concrete example of this invention is explained with the example of a comparison.
[0021] (Example 1) As polyolefine system resin which is the 1st component, using the antistatic agent by Sanyo Chemical Industries, Ltd., and PERESUTATTO 3000 (trade name) as copolymerization resin which is Sun Alomar polypropylene, E300A (trade name), and the 2nd component, these were mixed, it fabricated with monolayer T-die equipment, and the TIA sheet whose thickness is 1mm was produced. The copolymerization resin used by this example has polypropylene as a polyolefine system frame, and has a polyethylene glycol as a hydrophilic polymer frame. The content of copolymerization resin was made into 10 mass %. The forming performance force of monolayer T-die equipment is a part for 10m/at the maximum, and was fabricated by this example with the maximum velocity.
[0022] (Example 2) The TIA sheet was produced like the example 1 except having made the content of copolymerization resin into 5 mass %.
[0023] (Example 3) The TIA sheet of the two-layer structure of a main stratum and a surface was produced using multilayer T-die equipment. Sun Alomar polypropylene and E300A (trade name) were used for the ingredient which constitutes a main stratum. The surface was taken as the same presentation as what was used in the example 2. The main stratum set to 0.85mm, and the surface set thickness of each class to 0.15mm, and it set thickness in the whole TIA sheet to 1mm. The forming performance force of multilayer T-die equipment is a part for 10m/at the maximum, and was fabricated by this example with the maximum velocity.
[0024] (Example 1 of a comparison) It fabricated with the same monolayer T-die equipment as an example 1 using the polypropylene used in the example 1, and the TIA sheet whose thickness is 1mm was produced. The shaping rate of a TIA sheet was considered as a part for 10m/.
[0025] (Example 2 of a comparison) In the polypropylene used in the example 1, the carbon fiber by Toho Tenax Co., Ltd. and BESUFAITO HTA (trade name) were mixed as a carbon fiber, and the TIA sheet with a thickness of 1mm was produced with the same monolayer T-die equipment as an example 1 in it. The content of a carbon fiber was made into 10 mass %. In addition, about the shaping rate, since the surface specific resistance value of a TIA sheet would become high if a shaping rate is gathered, it lowered and went to the limitation that the effectiveness of a carbon fiber is demonstrated. When the shaping rate was lowered, there was a critical value to which a surface specific resistance value becomes small suddenly, and the shaping rate at that time was a part for 4m/in this example.
[0026] (Example 3 of a comparison) The TIA sheet of the two-layer structure of a main stratum and a surface was produced using multilayer T-die equipment. The thing of the same presentation as the example 2 of a comparison was used for the main stratum at the surface using the same polypropylene as the example 1 of a comparison. The main stratum set to 0.85mm, and the surface set thickness of each class to 0.15mm, and it set thickness in the whole TIA sheet to 1mm. About the shaping rate, it lowered and went to the limitation that the effectiveness of a carbon fiber is demonstrated, like the example 2 of a comparison. In this example, it was a part for 3m/.
[0027] A presentation and assessment result of the examples 1-3 mentioned above and the

examples 1-3 of a comparison are shown in a table 1. In addition, in a table 1, the case where the case where exceed "O" and 1.5 times for the case where they are the 1.5 or less times, on the basis of what used only polypropylene, and "O" and twice are exceeded for the case where it is 2 double less or equal is exceeded substantially twice also "**" and in it is expressed with "x" about ingredient cost. Moreover, about productivity, the case where the case where a TIA sheet is fabricated with the maximum velocity of shaping equipment is fabricated at the rate below "O" and one half of maximum velocity is expressed with "x."

[0028]

[A table 1]

	組　　成	表面固有抵抗値（Ω）	材料コスト	生産性
実施例1	ポリプロピレン 共重合樹脂　10質量% （PP／ポリエチレングリコール）	10^{10}	○	○
実施例2	ポリプロピレン 共重合樹脂　5質量% （PP／ポリエチレングリコール）	10^{11}	○	○
実施例3	表層 ポリプロピレン 共重合樹脂　5質量% （PP／ポリエチレングリコール 主層 ポリプロピレン	10^{11}	◎	○
比較例1	ポリプロピレン	10^{15}	◎	○
比較例2	ポリプロピレン 炭素繊維　10質量%	10^{6}	×	×
比較例3	表層 ポリプロピレン 炭素繊維　10質量% 主層 ポリプロピレン	10^{6}	△	×

[0029] In the examples 1-3, even if fabricated by the maximum capacity of T-die equipment, it could fabricate satisfactory, and the surface specific resistance value was also able to be set to 1011ohms or less, and the TIA sheet with sufficient antistatic engine performance was able to be obtained. On the other hand, in the example 1 of a comparison, although ingredient cost was also cheap and productivity was also good, a surface specific resistance value was not able to become high with 1015 ohms, and sufficient antistatic engine performance was not able to be given. Moreover, although the antistatic engine performance became sufficient thing by having made the carbon fiber contain in the examples 2 and 3 of a comparison, for that purpose, a lowering colander was not obtained but productivity has fallen the shaping rate below to one half as a result. As mentioned above, the TIA sheet which has the antistatic engine performance stabilized over the whole surface by making copolymerization resin with a polyolefine system frame and a hydrophilic polymer frame contain, without using a carbon fiber can be manufactured for high productivity.

[Translation done.]